



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

09/413,177

10/07/1999

LAP CHAN

CS99-107

1672

28112

7590

08/12/2004

GEORGE O. SAILE & ASSOCIATES

28 DAVIS AVENUE

POUGHKEEPSIE, NY 12603

EXAMINER

BROCK II, PAUL E

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 08/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 09/413,177	<b>Applicant(s)</b> CHAN ET AL.	
	<b>Examiner</b> Paul E Brock II	<b>Art Unit</b> 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 17 June 2004.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-18 and 22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,5,6,8-18 and 22 is/are rejected.
- 7) ☒ Claim(s) 3,4 and 7 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 October 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 5, 6, 15 – 17, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lur et al. (USPAT 5413962, Lur) in view of Staudinger et al. (USPAT 5481131, Staudinger).

Lur discloses a method of forming air gaps within an integrated circuit structure in figures 1 – 11.

With regard to claim 1, Lur discloses in figure 1 providing a semiconductor substrate (20) with a partially fabricated integrated circuit structure (22 – 24, and 28) having been created thereon and depositing a layer of dielectric (30) over the semiconductor substrate. Lur discloses in figure 1 forming a metal layer (40) on the dielectric layer. Lur discloses in figure 1 depositing a first thin layer of oxide (bottom most, 42) over the dielectric layer, thereby including the metal layer. Lur discloses in figures 2 – 7 forming a structure for first cavities over the first thin layer of oxide and aligned with the metal layer, the forming a structure for first cavities comprising applying (bottom most, 34) and patterning (27) a first layer of disposable solid followed by applying (third from bottom, 42) and patterning (processing between figures 6 and 7) a first layer

Art Unit: 2815

of oxide, the patterning a first layer of oxide further comprising forming a first (between the second and third from left, "51's") and a second (between the fourth and fifth from left, "51's") opening through said first layer of oxide, the first and second openings providing access to the first layer of disposable solid. Lur discloses in figures 9 and 10 forming a structure for second cavities above and aligned with the structure for the first cavities the forming a structure for second cavities comprising applying (middle 34) and patterning (middle via defining contact 29) a second layer of disposable solid followed by applying (middle 42) and patterning (figure 10) a second layer of oxide, the patterning a second layer of oxide further comprising forming a third (space left of left most 60) and a fourth (space to the right of the right most 60) opening through said second layer of oxide, the third and fourth openings providing access to the second layer of disposable solid, thereby creating overlying patterned first and second layers of disposable solid separated by the first layer of oxide and interconnected by the first and second opening formed through the first layer of oxide, the overlying patterned first and second layers of disposable solid being accessible via the third and fourth opening formed through the second layer of oxide. Lur discloses in figure 11 creating the first (bottom most section of 85) and the second (middle section of 85) cavities. Lur discloses in figure 11 performing an oxide (80) deposition over the surface of the second cavities creating a second thin layer of oxide. Lur does not disclose forming a metal inductor on the surface of the second thin layer of oxide. Staudinger teaches in figure 2 forming a high quality inductor over a semiconductor substrate (29) comprising forming a metal inductor (21) on a surface of a thin second layer of oxide (36). It would have been obvious to one of ordinary skill in the art at the time of the present invention to form the metal inductor of Staudinger on the second thin oxide of Lur in order to optimize the size and weight of

Art Unit: 2815

the semiconductor device by integrating both active and passive components onto the same chip as stated by Staudinger in column 1, lines 12 – 26.

With regard to claim 2, Lur discloses in figure 1 the forming a metal layer on the dielectric layer is forming a patterned layer of interconnect metal.

With regard to claim 5, Lur discloses in figures 10 and 11 that the creating a first and a second layer of cavities is removing the first and second layer of disposable solid, the removal to take place by accessing second layer of disposable solid by the third and fourth opening in the second layer of oxide, furthermore by accessing the first layer of disposable solid by the first and second openings in the first layer of oxide, creating a first layer and a second layer of dielectric comprising horizontal oxide fins (layers of oxide 42 after removal of disposable solid), further creating a first layer and a second layer of air gaps being interspersed with the first layer and a second layer of dielectric.

With regard to claim 6, Lur discloses in figures 10 and 11 that the performing an oxide deposition over the second layer of cavities is creating a thin layer of oxide over the second layer of oxide thereby furthermore closing the third and the fourth openings created in the second layer of oxide.

With regard to claims 15, Staudinger teaches in figures 13 – 15 that the inductor is spiral shaped.

With regard to claims 16, Staudinger teaches in figures 13 – 15 that the inductor is circular shaped.

With regard to claim 17, Staudinger teaches in figures 13 – 15 the polygonal inductor is an octagon.

Art Unit: 2815

With regard to claim 22, Lur discloses in figures 10 and 11 the layers of disposable solid being layers of nitride.

3. Claims 8 – 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lur and Staudinger as applied to claim 1 above, and further in view of Havemann et al. (USPAT 5668398, Havemann).

Lur and Staudinger do not teach that the disposable solid comprises a polymer.

With regard to claim 8, Havemann teaches in figures 5c and 5d; column 5, lines 49 – 67; and column 6, lines 15 – 25 a disposable solid that comprises a polymer. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the polymer of Havemann as the first and second disposable solids of Lur and Staudinger in order to form air gaps between metal leads of a semiconductor device using a class of materials that has a wide range of process flexibility based on material selection and process parameters.

With regard to claim 9, Havemann teaches in figures 5c and 5d; column 5, lines 49 – 67; and column 6, lines 15 – 25 the creating cavities is heating the substrate in oxygen, evaporating the disposable solid layer using O<sub>2</sub> plasma.

With regard to claim 10, Havemann teaches in figures 5c and 5d; column 5, lines 49 – 67; and column 6, lines 15 – 25 the creating a layer of cavities is introducing a solvent to the substrate dissolving the polymer.

With regard to claim 11, Havemann teaches in figures 5c and 5d; column 5, lines 49 – 67; and column 6, lines 15 – 25 wherein creating a first and a second layer of cavities is heating the substrate, evaporating the polymer.

Art Unit: 2815

With regard to claim 12, Havemann teaches in figures 5c and 5d; column 5, lines 49 – 67; and column 6, lines 15 – 25 wherein creating cavities is applying a vacuum to the substrate, dissolving the polymer.

It would further be obvious that Havemann applies to both the first and second disposable solids of Lur and Staudinger.

4. Claims 13, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lur and Staudinger as applied to claim 1 above, and further in view of Abidi et al.

With regard to claim 13, Lur and Staudinger do not disclose an insulating layer deposited over the surface of the inductor. Abidi et al. teaches in figures 6a – 6c depositing an insulating layer (20) over the surface of an inductor (76) thereby encapsulating the inductor. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the insulating layer of Abidi et al. to encapsulated the inductor of Lur and Staudinger in order to insulated the inductor from surroundings outside of the chip as is well known in the art.

With regard to claim 18, Lur and Staudinger do not specify properties of the inductor. Abidi et al. discloses in column 7, lines 34 – 37 an inductor having an inductance in excess of 1 nh and a self-resonance in excess of 10 MHz. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use an inductor with the disclosed properties of Abidi et al. in the method of Lur and Staudinger in order to have an RF tuned amplifier that can be fabricate having a large value monolithic inductor thereby substantially increasing as stated by Abidi et al in column 7, lines 35 – 42.

Art Unit: 2815

5. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lur and Staudinger as applied to claim 1 above, and further in view of one of ordinary skill in the art.

It is not clear if the partially fabricated integrated circuit structure of Lur and Staudinger comprising transistors being CMOS and are interconnected to form an RF amplifier. It is well known in the art to form partially fabricated integrated circuit structures that are transistors being CMOS interconnected to form an RF amplifier. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use have the devices of Lur and Staudinger bet CMOS transistors in RF amplifier circuits in order to create a circuit that has exceptionally high input impedance (e.g. megohms), square law transfer characteristics which result in low cross modulation products, and wide dynamic operating range.

#### ***Allowable Subject Matter***

6. Claims 3, 4, and 7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### ***Response to Arguments***

7. Applicant's arguments filed June 17, 2004 have been fully considered but they are not persuasive.



Art Unit: 2815

8. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Therefore the applicant's arguments are not persuasive and the rejection is proper.

9. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., dielectric of air surrounding interconnect metal...) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Therefore the applicant's arguments are not persuasive and the rejection is proper.

10. In response to applicant's argument that "None of the applied references address the problem of creating a high inductive value, high frequency inductor overlying a layer of metal," the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

11. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the

Art Unit: 2815

teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, all of the combinations of references have appropriate motivations to combine. In all such above combinations the motivation may be found after the phrase "...in order to...". Applicant has not pointed out specifically why any of these motivations fail. Therefore, applicant's arguments are not persuasive, and the rejections are proper.

12. With regard to applicant's argument that none of the references "provide for the creation of horizontal air gaps that are interspersed with layers of dielectric while further none of the inventions provide for a method of removal of a disposable solid, such as nitride, for the creation of the air gaps as claimed in the claims of the instant invention," it should be noted that these features are not claimed in independent claim 1. Further, these features are disclosed by primary reference Lur. Therefore, applicant's arguments are not persuasive, and the rejections are proper.

13. With regard to the applicant's argument that the "processes of Figs. 1 – 11 are believed to be both novel and patentable over these various references," it should be noted that the claims, not the figures, need to be both novel and patentable over the references. Therefore the applicant's arguments are not persuasive and the rejection is proper.

***Conclusion***

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul E Brock II whose telephone number is (571) 272-1723. The examiner can normally be reached on 8:30 AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2815

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Paul E Brock II

A handwritten signature in black ink, appearing to read "Paul E Brock II", with a stylized flourish at the end.